Heat Pipe Technology

In the early days of space flight, NASA sought to solve a problem stemming from the fact that Sun-facing surfaces of a non-rotating satellite become excessively hot while surfaces not exposed to the Sun become very cold. Since this temperature differential could cause failure of electronic and other spacecraft systems, NASA contracted with Los Alamos Scientific Laboratory (LASL) for development of a heat distribution system for non-rotating satellites.

LASL's answer was the heat pipe, a sealed chamber whose walls are lined with a "wick," a thin capillary network containing a working fluid in liquid form. When heat is applied to a portion of the pipe, the working fluid evaporates and carries the heat away from the heated pipe segment. As the vapor comes in contact with cooler sections of the pipe, it condenses, releasing heat, warming the hitherto cool pipe segments and restoring the vapor to liquid form. The liquid is then returned through the wick to the heat source to be vaporized again, providing a continuous heat transfer mechanism.

James M. Stewart, Greenville, South Carolina, an independent consultant to the plastics industry, obtained detailed information on heat pipes through NASA's Technology Applications Center at the University of New Mexico. Stewart incorporated the NASA/LASL technology, among others, in his own development of patented "heat tubes" that improve temperature control in plastics manufacturing equipment.

In 1978, when Kona Corporation, Gloucester, Massachusetts was formed to manufacture plastic extrusion and molding equipment, the company obtained a license from Stewart for the use of heat tubes. This technology, Kona Corporation states, offers an answer to a problem common in plastics manufacture: high maintenance costs and excessive molding machine downtime due to frequent burnout of heater bands normally used to distribute heat to molding nozzles and other equipment. The Kona Nozzle® for heaterless injection molding gets heat for its operation from an external source and has no internal heating bands, reducing machine maintenance and also eliminating electrical hazards associated with heater bands.

Eastman Kodak® Company, Rochester, New York uses Kona Nozzles to maintain uniform heating of plastics in molding parts for cameras; at lower left, a company employee is holding the nozzle in his left hand and the molded back of an instant camera in his right. The nozzles are also used by Bic Pen Corporation, Milford, Connecticut for molding pens and lighters such as those shown below. Among other products molded by Kona Nozzles are Polaroid cameras, Tupperware plastic kitchenware, Ford Motor Company auto components, RCA television cabinets, and Western Electric telephones and components.

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